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AUTHORITY

SMUFD D/A ltr, 15 Feb 1972

TRANSLATION NO. 2177

DATE: 4 April 1968

DEPARTMENT OF THE ARMY
Fort Detrick
Frederick, Maryland

THE INFLUENCE OF EARLINESS AND TARDINESS ON SOME WINTER WHEAT VARIETIES ON YIELD POTENTIAL AND ON PRODUCTION QUALITY IN THE AGROCLIMATIC CONDITIONS OF BANAT REGIUNE

Lucr. Sti. Inst. Agron. Timiscaia
Vol 8, pages 117-130, 1965

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The productivity of cultivated crops is a complex characteristic which depends on the genetic base of the soil, on concordance in the biological requirements and the ecological conditions, on the potential for assimilating the environmental conditions, on the degree of adaptation, the degree of resistance to bad weather, pathogenic agents, insect pests, etc.

The production capacity of different varieties of wheat was studied as a function of the majority of factors that determine it.

The characteristics and traits that concur in the realization of productivity in wheat and also the relationships between these and the factors that cause them have been studied by many scientists.

For instance, Giosan and collaborators (1964), in studying the stages of morphogenesis for several varieties of wheat, found that these stages were of differing sensitivity and duration for different wheats and that the traits of earliness or tardiness are caused by the duration and the moment at which the wheat is planted.

Degras (1964) found that determination of cereal productivity by means of analysis of the morphological components is the most expeditious method, but that in order for it to be effective it must be extended to the largest possible number of

characters. The combination of this method with the genetic and physiological method leads to the most reliable conclusions.

Jonard (1951, 1964) established that productivity is correlated with the rate of growth and the rate of formation of the plant organs and especially the spike and its elements.

Jonard (1964), Saulescu and collaborators (1963, 1964) not only analyzed several components of the production of wheat, but also established the degree of variation in these components as a function of agrophytotechnical factors.

For determination of the productivity of different varieties of wheat, Rusmini (1958, 1960, 1962), Maliani (1958-1964), Simon (1960), Dracea and collaborators (1964) analyzed the components of productivity by taking into account the duration of the phases and the vegetation cycle, as well as the limiting factors of these factors.

Biological research has proved that for the majority of cultivated crops the late varieties are more productive since they have the possibility for assimilating nutritive substances over a longer period of time.

For some cultivated crops, including cereals, the trait of earliness has a special and sometimes decisive importance in respect to production and quality, especially in the dry regions and during years when there are strong attacks of plant disease and heat waves during the period in which the wheat forms and ripens.

Based on these considerations, we proposed to study the production capcity and production quality for 28 varieties of imported wheat cultivated during the years 1962-1964, with emphasis on the results of 1964, a year that was not favorable for growing wheat in the agroclimatic conditions in the Banat.

Work Method

The wheat varieties studies were grown in the collection field of the Plant Improvement Laboratory of the Lovrin (Banat) Experimental Agricultural Station. The planting was accomplished using the grain to grain method at a distance of 18.5 centimeters each year in the period 1-10 October. The sprouting took place in the fall, but at times which differed from one variety to another but still assured tillering.

During the vegetation period, numerous phenological observations were made.

At maturity, 100 plants of each variety were harvested by pulling them out by the roots and then they were checked for

the following: the number of tillers (fertile and sterile), the weight of the spike, the length of the main spike, the number of spicules, the number of grains in the spike and per plant, and the weight of the grains in the spike and per plant.

The grain from the 1964 harvest was also analyzed in terms of quality by determining the weight and volume of 1,000 grains, the vitrescence, the frequency of small grains, the dry and wet gluten content, and the quality of the gluten using the Pelshenke and Berliner method. The flour and bran categories were also determined, by sifting the grain in seives with holes having the following diameters: 0.2 millimeters, 0.3 millimeters, and 0.6 millimeters.

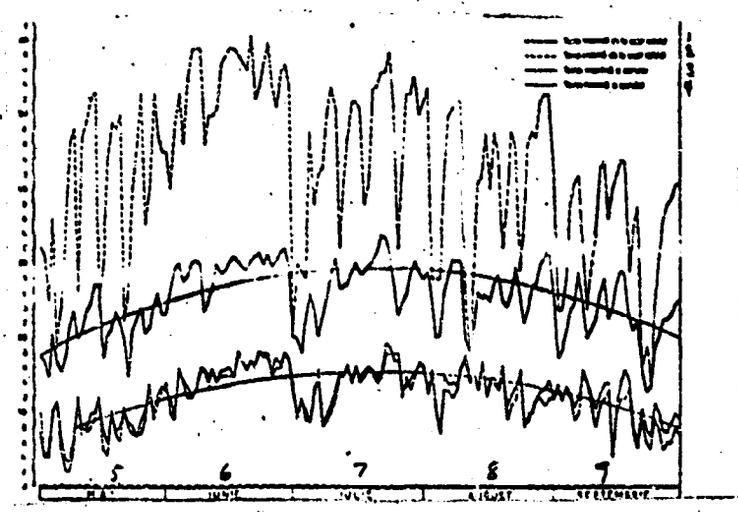

Figure 1. Variation of Maximum and Minimum Daily Temperatures of Soil Surface Air.

Key: 1. Maximum Temperature of Soil Surface;
2. Minimum Temperature of Soil Surface;
3. Maximum Temperature of Air;
4. Minimum Temperature of Air;
5. May;
6. June;
7. July;
8. August;
9. September.

It is known that the elements of productivity are influenced to a very great extent by the value of the temperature and the relative humidity of the air. To explain the variabilities of the productivity elements from one year to another, the usual thing is to use the average monthly, ten-day, or even one day value of the climatic factors. We feel that using the average values to explain productivity is a mistake, and therefore

we used the maximum and minimum daily values of the main climatic factors on the basis of our feeling that the limits of these values are the determining factors and not their average.

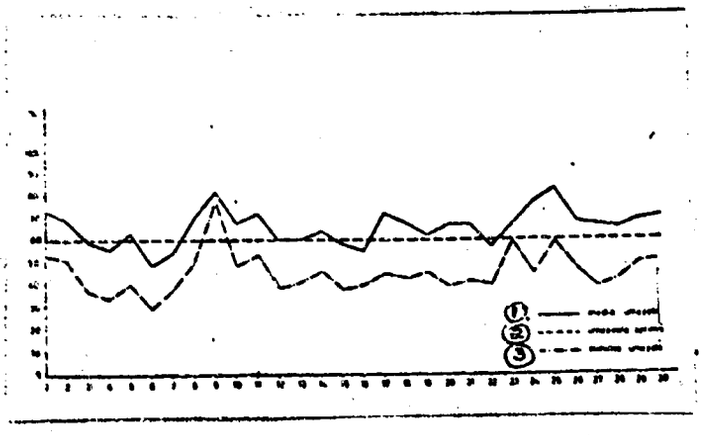

Figure 2. Daily Variation in the Average and Minimum Relative Humidity of the Air For the Month of June, 1964, at Sinnicolaul Mare

Key: 1. Average humidity;
2. Optimum humidity;
3. Minimum humidity.

For example, we can blame the low productivity of all of the wheat varieties in 1964 on the extent of the variation between the maximum and minimum daily temperatures and the daily relative humidity of the air during the month of June, which was unusually high and surpassed the biological requirements of the plants. This data is presented in Figures 1 and 2.

Since the wheat varieties studied were recently introduced into Rumania, it was felt necessary to study the duration of the vegetation period by vegetation phases so as to determine the sum of the temperature degrees for each phase and then the vegetation duration of the respective varieties and the sum of the temperature degrees necessary and on this basis to classify them into early and late varieties, with the demarcation limit being 253 days, as shown in Figure 3.

Results Obtained

The results obtained from the analysis of the varieties studied are presented in Table 1 for the early varieties and in Table 2 for the late varieties. Analyzing the data in these tables we find the following:

1. The number of fertile tillers and especially their uniformity is a characteristic that influences production.

For the early variety group the average number of fertile tillers ranged between 2.89 and 7.45. The highest tillering capacity was shown by the Knox, Norin 46, and 4044 (Iran) varieties and the smallest by the Iugoslavia C, Fiorello, Triumph, and Etoile de Choisy varieties.

The late varieties have a greater tillering capacity, with the average number of fertile tillers ranging between 4.75 and 7.20.

The Miche, Norin 58, Beloterkovskaia 198 and Kanred varieties were especially outstanding.

From the standpoint of the number of sterile tillers, it was found that there were no great differences between the two groups of varieties. A relatively large number of sterile tillers were found in the French varieties: Paris Vilmorin (2.06), Vilmorin (2.22), and Etoile de Choisy (1.84).

2. The weight of the spikes per plant gives a sure index of productivity.

For the early varieties the weight of the spikes per plant ranged between 5.86 and 11.14 grams, and for the late variety group between 6.32 and 12.81 grams. The late varieties have heavier spikes than the early varieties. Greater differences are also found from one year to another for the late varieties especially. The smallest weight was recorded in 1964, a year with great heat waves during the period the wheat formed and ripened. For example, the total weight of the spikes per plant was unusually low for the Alba (4.02 grams), Miche (5.05 grams), Vilmorin (4.69 grams), Norin 58 (4.29 grams) varieties.

3. The length of the main spike is very different from one variety to another and even for the same variety in different years. In general, the varieties with the longer vegetation periods have a longer spike than the early varieties.

For the early varieties the average length of the main spike ranged between 6.49 centimeters (San Pastore) and 9.32 centimeters (Iugoslavia C), and for the late varieties between 8.20 centimeters (Norin 59) and 11.66 centimeters (Paris Vilmorin).

4. The number of spicules in the main spike also varies from one variety to another, but to a lesser extent.

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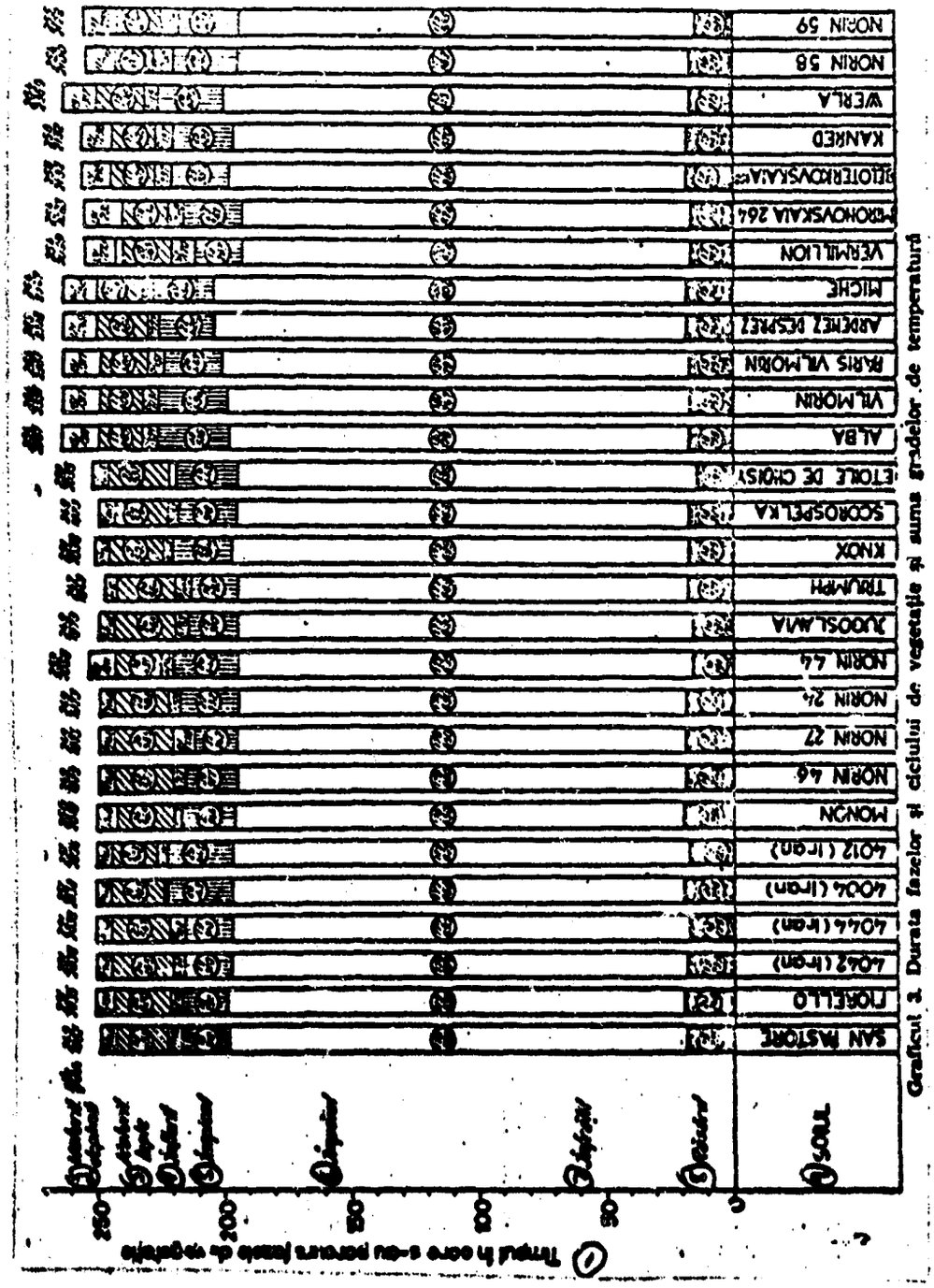

Figure 3. Duration of Vegetation Phases and Cycle and Sum of the Temperature Degrees

Key: 1. Time spent in vegetation phases;
2. Full maturity;

3. Milk maturity phase;
4. Flowering phase;
5. Spiking phase;
6. Haying phase;
7. Tillering phase;
8. Sprouting phase;
9. Variety.

For the early varieties the limits range between 14.48 spicules (Triumph) and 19.29 spicules (Etoile de Choisy), while for the late varieties there are a large number of spicules with the limits ranging between 16.69 spicules (Norin 59) and 21.83 spicules (Werla).

5. The number of grains in the main spike varies within quite large limits from one variety to another, and the differences between the two groups of varieties is not significant.

Among the early varieties there is a larger number of grains in the main spike of the following varieties: Norin 24 (40.05), 4044 (Iran) (38.83), Norin 44 (34.90); the late varieties having a larger number of grains are the Beloterkovskaia 198 (40.18), Miche (45.35) and Vermillion (44.77).

6. The weight of the grains in the main spike differs from one variety to another, especially in the late varieties where the limits are quite large, ranging from 0.76 (Werla) to 1.45 grams (Mironovskaia 264). Also, for the weight of the grain per plant, large differences were found in 1964 in regard to the weight of the grains in the main spike. For instance, for the Alba variety the weight of the grain in the main spike was 1.12 grams in 1963, compared to only 0.47 grams in 1964; for the Miche variety, in 1963 the weight of the grain in the main spike was 1.82 grams, compared to 0.87 grams in 1964; for the Werla variety in 1962 the weight was 1.10 grams and in 1964 only 0.42 grams.

7. The number of grains per plant differs from one variety to another, Of the early varieties, the greatest number of grains was produced by the Norin 44 (145.63), San Pastore (144.34) varieties, while for the late varieties by the Beloterkovskaia (175.89), Vermillion (148.74) and Norin 59 (144) varieties.

This characteristic does not differ markedly from one group to another.

8. The weight of the grains per plant is the characteristic that to the greatest extent indicates the production capacity and also provides some guidance in respect to quality.

Table 1. Results Concerning the Analysis of Some Traits and Characteristics of Early Winter Wheat

1 Nr. crt.	2 Soiul	3 Nr. fraților fertili $X \pm s_x$	4 Nr. fraților sterili $X \pm s_x$	5 Greutatea spicelor g $X \pm s_x$	6 Lungimea spicului principal cm $X \pm s_x$
1	San Pastore	6,08 ± 0,50	0,93 ± 0,18	8,78 ± 0,83	6,49 ± 0,05
2	Fiorello	4,60 ± 0,51	1,47 ± 0,19	8,44 ± 1,67	8,19 ± 0,80
3	Skorospelka 3 b.	5,20 ± 0,07	0,35 ± 0,35	6,31 ± 0,02	7,35 ± 0,10
4	Triumph	5,43 ± 0,51	0,50 ± 0,31	7,14 ± 0,14	7,25 ± 0,24
5	Norin 26	6,99 ± 1,69	0,39 ± 0,08	6,81 ± 0,45	8,75 ± 1,59
6	Norin 27	5,43 ± 0,32	1,15 ± 0,90	6,68 ± 0,36	8,42 ± 0,07
7	Norin 24	5,32 ± 0,78	0,30 ± 0,25	8,81 ± 0,79	8,24 ± 0,01
8	Norin 44	6,57 ± 1,25	5,56 ± 1,18	9,15 ± 2,17	8,91 ± 0,09
9	Iugoslavia C.	2,80 ± 0,10	0,04 ± 0,002	5,86 ± 0,04	9,32 ± 0,79
10	Knox	7,45 ± 0,21	1,20 ± 0,20	8,50 ± 0,38	7,90 ± 0,60
11	Monon	5,27 ± 0,08	0,83 ± 0,26	7,65 ± 0,58	7,51 ± 0,49
12	4042 (Iran)	6,22 ± 1,35	1,10 ± 0,96	7,60 ± 0,85	6,60 ± 0,20
13	4044 (Iran)	6,14 ± 1,80	0,45 ± 0,38	11,14 ± 3,85	9,22 ± 0,02
14	4004 (Iran)	5,80 ± 1,15	1,26 ± 0,85	6,78 ± 1,66	8,03 ± 0,06
15	4012 (Iran)	5,60 ± 1,64	1,14 ± 0,21	7,64 ± 1,97	8,99 ± 0,53
16	Etoile de Choisy	5,10 ± 1,14	1,84 ± 0,04	7,67 ± 2,31	9,11 ± 0,03

7 Nr. de spiculețe $X \pm s_x$	8 Nr. de boabe/spic $X \pm s_x$	9 Greutatea boabelor spic g $X \pm s_x$	10 Nr. boabelor planță $X \pm s_x$	11 Greutatea boabelor/ planță g $X \pm s_x$
16,20 ± 0,17	33,71 ± 0,32	1,19 ± 0,001	141,31 ± 32,00	4,50 ± 0,84
17,75 ± 1,10	32,44 ± 3,03	1,41 ± 0,37	135,62 ± 1,07	4,09 ± 1,80
15,14 ± 0,23	34,26 ± 1,68	1,31 ± 0,05	127,57 ± 4,17	4,42 ± 0,11
14,43 ± 0,30	27,25 ± 0,54	1,11 ± 0,07	98,12 ± 9,12	3,63 ± 0,01
16,56 ± 2,06	27,76 ± 3,42	0,81 ± 0,13	126,20 ± 3,35	3,40 ± 0,74
16,06 ± 0,55	31,88 ± 0,50	0,96 ± 0,05	120,50 ± 2,75	3,11 ± 0,08
17,61 ± 0,05	40,05 ± 0,74	1,41 ± 0,03	110,70 ± 18,35	4,37 ± 0,23
17,65 ± 0,11	34,90 ± 0,22	1,16 ± 0,03	143,63 ± 28,39	4,48 ± 1,02
16,62 ± 0,02	29,23 ± 4,29	1,31 ± 0,03	53,02 ± 0,03	2,14 ± 0,01
13,50 ± 0,40	29,04 ± 1,03	0,96 ± 0,05	136,65 ± 7,03	4,33 ± 0,32
16,00 ± 0,27	33,62 ± 1,23	1,23 ± 0,07	130,89 ± 20,69	4,14 ± 0,82
15,63 ± 0,36	33,13 ± 4,01	1,02 ± 0,09	122,07 ± 21,02	3,76 ± 0,56
16,38 ± 0,51	38,83 ± 2,56	1,54 ± 0,16	162,12 ± 64,50	5,90 ± 2,26
16,38 ± 0,09	27,48 ± 0,47	0,96 ± 0,10	104,10 ± 34,30	3,86 ± 1,33
16,42 ± 0,77	36,94 ± 0,21	1,22 ± 0,18	88,38 ± 26,53	3,46 ± 0,87
19,20 ± 1,43	35,04 ± 2,06	1,22 ± 0,16	110,78 ± 33,37	3,68 ± 1,28

Key: 1. Number;
2. Variety;
3. Number of fertile tillers;
4. Number of sterile tillers;
5. Weight of spikes in grams;
6. Length of main spike in centimeters;
7. Number of spicules;
8. Number of grains per spike;
9. Weight of grains per spike in grams;
10. Number of grains per plant;
11. Weight of grains per plant in grams.

Table 2. Results Concerning the Analysis of Some Traits and Characteristics of Late Winter Wheat

1 Nr. crt.	2 Soiul	3 Nr. fraților fertili $X \pm s_{\bar{x}}$	4 Nr. fraților sterili $X \pm s_{\bar{x}}$	5 Greutatea spicelor g $X \pm s_{\bar{x}}$	6 Lungimea spicului principal cm $X \pm s_{\bar{x}}$
1	Alba	5,15±1,25	0,44±0,02	6,33±2,37	9,50±0,17
2	Vilmorin	5,40±1,02	2,22±0,83	6,32±1,62	11,95±0,90
3	Paris Vilmorin	6,21±1,32	2,05±0,04	7,52±0,35	11,65±0,14
4	Ardeaez Desprez	4,75±0,37	0,95±0,20	6,50±1,18	9,18±1,02
5	Miche	7,20±2,54	1,47±0,11	12,91±7,76	10,30±0,14
6	Vermillion	5,63±0,58	0,30±0,05	8,45±2,13	9,55±0,14
7	Mironovskaia 264	4,94±0,50	0,27±0,17	8,14±1,26	8,83±0,76
8	Bicloțerkovskaia 198	6,60±0,58	1,40±0,47	10,99±1,80	9,92±0,31
9	Kanred	5,58±0,26	1,35±0,62	7,56±0,30	8,49±0,41
10	Werla	4,88±1,49	1,08±0,24	6,30±3,15	10,40±0,64
11	Norin 58	6,79±1,16	1,10±0,12	7,58±2,06	8,21±1,42
12	Norin 38	6,38±0,59	0,53±0,19	6,37±0,05	8,20±0,31

7 Nr. de spiculețe $X \pm s_{\bar{x}}$	8 Nr. de boabe/spic $X \pm s_{\bar{x}}$	9 Greutatea boabelor/spic g $X \pm s_{\bar{x}}$	10 Nr. boabelor planță $X \pm s_{\bar{x}}$	11 Greutatea boabelor/ planță g $X \pm s_{\bar{x}}$
18,02±1,30	30,04±5,41	0,79±0,32	100,82±50,20	2,79±2,48
21,21±0,46	23,46±0,63	0,82±0,05	107,82±40,68	3,04±1,25
21,35±0,51	35,90±2,51	0,83±0,15	107,67±3,25	2,43±0,05
18,95±0,49	29,00±2,16	0,99±0,03	95,28±27,18	2,82±0,74
18,57±0,54	45,35±18,77	1,34±0,47	119,53±55,20	3,94±2,03
21,28±1,73	44,77±0,97	1,41±0,17	148,74±35,55	4,56±0,72
17,48±2,43	34,98±4,33	1,45±0,01	129,17±33,03	4,47±1,53
19,49±0,22	40,18±3,46	1,32±0,13	175,89±29,04	5,70±1,59
17,58±1,29	33,75±2,01	1,11±0,02	123,10±9,04	3,79±0,60
21,83±2,67	29,07±5,74	0,76±0,33	75,55±35,99	2,21±1,21
17,12±1,79	27,52±2,34	0,86±0,15	122,85±24,18	3,78±0,95
16,69±0,34	30,98±2,05	1,15±0,09	144,00±28,60	4,72±1,44

Key: 1. Number;
2. Variety;
3. Number of fertile tillers;
4. Number of sterile tillers;
5. Weight of spikes in grams;
6. Length of main spike in centimeters;
7. Number of spicules;
8. Number of grains per spike;
9. Weight of grains per spike in grams;
10. Number of grains per plant;
11. Weight of grains per plant in grams.

Table 3. Results of Analyses of Quality in the Group of Early Winter Wheat Varieties

1 Nr. crt.	2 Soiul	3 Gr. a 1000 boabe g	4 Volum a 100 boabe cmc.	5 Sticlozitatea %	6 Frecvența glăsticelii %
1	San Pastore	34,0	28,3	36	13
2	Fiorello	38,8	34,5	28	23
3	4042 (Iran)	32,1	26,1	74	12
4	4044 (Iran)	37,1	32,0	57	9
5	4004 (Iran)	36,6	28,6	73	13
6	4012 (Iran)	34,3	29,1	49	24
7	Monon	30,7	24,8	16	15
8	Norin 46	31,1	30,0	29	36
9	Norin 27	27,2	24,3	65	12
10	Norin 24	29,4	25,8	51	21
11	Norin 42	31,0	27,1	60	22
12	Iugoslavia C.	29,0	37,0	73	17
13	Triumph	36,2	30,3	42	6
14	Knox	32,8	25,8	18	10
15	Etoile de Choisy	32,9	30,5	30	20
16	Skorospelka 3 b	34,5	27,8	60	9

7 Conținut gluten		10 Calitatea gluten		13 Categoria de tărîțe și făină resultate prin cernere, %			
8 Umed %	9 Uscat %	11 Indicele Pelsheake	12 Indicele Berliner	14 Sita Ø=0,6 mm	15 Sita Ø=0,3 mm	16 Sita Ø=0,2 mm	17 Sita Ø=0,2 mm
42,7	10,7	35	0,5	2,8	31,0	47,2	19,0
45,0	12,0	106	4	2,4	37,2	39,2	21,2
45,6	15,0	51	12	7,4	30,4	31,2	31,0
44,0	14,0	100	11	—	—	—	—
41,0	12,0	155	16	6,2	28,4	21,2	44,2
46,6	13,5	45	11	—	—	—	—
43,0	12,5	128	12	14,2	22,0	17,8	46,0
49,0	13,0	54	10	2,4	27,5	43,5	26,6
53,0	14,0	50	8	6,4	41,2	27,2	25,2
42,0	11,5	80	9	23,1	17,6	40,2	19,1
50,0	13,0	77	17	2,2	48,8	22,0	27,0
75,0	21,0	70	11	15,0	54,1	26,4	4,5
54,5	12,5	77	12	15,1	44,3	15,0	25,6
40,0	11,0	65	9	11,6	27,4	16,0	44,8
44,5	12,5	66	10	12,2	27,8	27,2	32,8
42,0	14,5	113	10	16,0	41,6	32,0	10,4

Key: 1. Number;
2. Variety;
3. Weight of 1,000 grains in grams;
4. Volume of 1,000 grains in cubic centimeters;
5. Vitrescence in %;
6. Frequency of shrivelling in %;
7. Gluten content;
8. Wet;
9. Dry;
10. Gluten quality;
11. Pelshenke index;
12. Berliner index;
13. Flour and bran category resulting from seiving, in %;
14. 0.6 millimeter seive diameter;
15. 0.3 millimeter seive diameter;
16. 0.2 millimeter seive diameter;
17. 0.2 millimeter seive diameter/

Table 4. Results of Analyses of Quality in the Group of Late Winter Wheat Varieties

1 Nr. crt.	2 Soiul	3 Gr. a 1000 boabe g	4 Volum a 1000 boabe cmc.	5 Sticlozitatea %	6 Frecventa sistaviril %
1	Alba	16 0	18,0	—	100
2	Vilmorin	23,0	24,5	33,5	94
3	Paris Vilmorin	22,7	22,5	18,0	85
4	Ardenez Desprez	28,1	27,2	30,7	70
5	Miche	26,8	27,3	43,5	97
6	Vermillion	30,1	25,5	40,7	23
7	Mironovskaia 264	33,5	29,3	63,0	49
8	Beloţerkovskaia 198	31,3	29,7	60,0	67
9	Kanred	29,5	27,0	48,5	49
10	Werla	20,8	23,0	25,5	100
11	Norin 58	28,7	25,0	70,7	28
12	Norin 59	31,0	26,4	82,0	60

7 Continut gluten		10 Calitatea gluten		13 Categoria de tărîte şi făină rezultate prin cernere, %			
8 Umed %	9 Uscat %	11 Indicele Peisheuke	12 Indicele Berli ner	14 Sita Ø=0,5 mm	15 Sita Ø=0,3 mm	16 Sita Ø=0,2 mm	17 Sita Ø=0,2 mm
—	—	31	—	3,5	38,5	43,5	15,5
38,0	13,0	35	5	18,8	53,4	20,2	7,6
49,0	15,0	24	2	17,7	29,9	32,2	20,2
43,0	12,5	58	12	19,9	30,0	34,1	16,0
48,0	15,0	25	0,5	20,2	39,2	21,2	18,4
34,0	9,0	77	9	4,0	25,0	19,0	52,0
42,0	12,0	152	15	17,0	44,8	15,2	23,0
46,0	17,0	131	16	11,2	39,0	18,4	31,4
47,0	12,0	59	9	17,6	36,2	16,2	30,0
45,0	12,0	25	2	19,8	21,8	38,4	20,0
48,0	15,0	48	7	17,3	39,3	15,3	28,1
42,0	13,0	76	11	4,0	34,0	26,0	36,0

Key: 1. Number;
2. Variety;
3. Weight of 1,000 grains in grams;
4. Volume of 1,000 grains in cubic centimeters;
5. Vitrescence in %;
6. Frequency of shrivelling in %;
7. Gluten content;
8. Wet;
9. Dry;
10. Gluten quality;
11. Pelshenke index;
12. Berliner index;
13. Flour and bran category resulting from seiving, in %;
14. 0.6 millimeter seive diameter;
15. 0.3 millimeter seive diameter;
16. 0.2 millimeter seive diameter;
17. 0.2 millimeter seive diameter.

It should be noted that for the early varieties of winter wheat there are no great differences in respect to the weight of the grains from one year to another, while for the late varieties there were very large differences noted between the weight of the grains per plant in 1964 and in the previous two years. This decrease is explained by the fact that the almost daily temperatures of over 30 degrees Centigrade during June (Figure 1) and the low precipitation during that period had extensive unfavorable effects on the late varieties, which at that time were forming the grain, and thus caused lower production. For example, for the Alba variety the production of grains per plant in 1964 was 0.31, compared to 5.28 grams in 1963; for the Ardenez Desprez variety the production in 1964 was 1.87 grams, compared to 6.04 grams in 1963; for the Norin 58 variety the production was 3.28 grams in 1964, compared to 6.16 grams in 1963.

Tables 3 and 4 show the values of some traits and characteristics with the aid of which it is possible to make an indirect estimate of the quality of the production of the varieties studied.

9. The weight of 1,000 grains is less in the late varieties than in the early varieties. As pointed out above, this can be explained by the fact that these varieties encountered unfavorable conditions during the formation and ripening period for the grain, i.e., maximum temperatures of over 30 degrees Centigrade, relatively low humidity of the air, and very little precipitation.

The early varieties formed grains with an even lower weight under the climatic conditions of 1964, with the limits ranging between 27.2 grams (Norin 27) and 38.3 grams (Ficrello).

The majority of the late varieties had weights for 1,000 grains under 25 grams, for example, the Alba (16 grams), Vilmorin (23 grams), Paris Vilmorin (22.7 grams) and Werla (20.8 grams) varieties. The heaviest weights for 1,000 grains were found in the Mironovskaia 264 (33.5), Beloterkovskaia 198 (31.3 grams) and Vermillion (30.1 grams) varieties.

10. The volume of 1,000 grains is a very valuable index in estimating the size and degree of fullness of the grain. From analysis of the data obtained, it is found that the late varieties that generally have a smaller weight for 1,000 grains also have a smaller volume, ranging between 18 cubic centimeters (Alba) and 29.7 cubic centimeters (Beloterkovskaia 198). The early varieties had volumes for 1,000 grains ranging between 24.3 cubic centimeters (Norin 27) and 37 cubic centimeters (Iugoslavia C).

11. The vitrescence was greatly influenced by the climatic conditions of 1964 in both the early and the late varieties. In the early variety group, the greatest percentage of vitrescent grains were found in the following varieties: 4042 (Iran)- 74%, 4004 (Iran)- 73%, Iugoslavia C - 73%, Norin 27 - 65%, Norin 44 - 60%, and Skorospelka 3B - 60% vitrescent grains.

In the late winter wheat varieties the highest percentages of vitrescent grains were found in the Norin 59 (82%), Norin 58 (70.7%), Mironovoskaia 264 (63%) and Beloterkovskaia 198 (60%) varieties.

12. The frequency of grain shrivelling was much greater in the late varieties and to a great extent caused the decrease in production and the depreciation in the quality. The Alba and Werla varieties had 100% shrivelled grains, followed by the Miche variety with 97%, the Vilmorin with 94%, and the Paris Vilmorin with 85%.

For the early varieties the frequency of grain shrivelling ranged between 6% for the Triumph variety to 36% for the Norin 46 variety. The majority of the varieties in this group had a low frequency of grain shrivelling.

13. The gluten content varied greatly. In the early varieties the dry gluten content ranged between 10.7% (San Pastore) and 21% (Iugoslavia C). The Iranian 4042 variety (15%) also had a high gluten content. For the late varieties the gluten content was smaller and tanged between 9% (Vermillion) and 17% (Beloterkovskaia 198).

14. The gluten quality, determined through the two classical methods, shows very different values from one group to another and from one variety to another. For instance, the Pelshenke index has values ranging between 35 and 155 for the early varieties and the Berliner index has different values among the different varieties but ranging between practically equal limits for both groups of varieties, i.e., 0.5-17. A positive correlation was observed between the gluten content and the other traits of the grains, but no correlation was noted between the gluten content and the grain quality for a large number of varieties.

The early varieties have good and very good quality indices, with the exception of the San Pastore variety, which had a poor quality index.

On the other hand, the late varieties are included in the inferior category or at the bottom of the medium quality category.

15. The relationship between flour and bran was determined

in order to establish even better the extent to which the trait of earliness influences the quality of production in the varieties studied. The data obtained indicate that the relationship between the flour and the bran is more favorable in the early varieties than in the late varieties.

Conclusions

The following conclusions were reached on the basis of comparative analysis of the results obtained from the two groups of varieties in different years:

1. Although Banat Regiune generally has favorable conditions for growing high productivity wheat, because of the periodic intervention of such unfavorable factors as drought and excessively high temperatures during June, the production of grain is diminished and the quality drops.

2. In very favorable years for growing wheat, the late varieties yield the highest production, while in the years in which unfavorable factors intervene during June the early varieties yield greater production and better quality than the late varieties.

3. Since the early varieties for the most part have the grain formed at a time when the unfavorable factors intervene, they are less influenced by this and in such years their production is superior.

4. The decrease in production and reduced quality in the late varieties are also caused by the phenomenon of shrivelling of the grain. The grain shrivelling appears on a differentiated basis from one variety to another as a function of the length of the vegetation period and especially the period in which the grain forms and fills out.

5. Since the appearance of the climatic conditions that cause grain shrivelling is frequent in Banat Regiune in the last 10 days of June, it appears necessary to create and introduce some early and semi-early varieties of winter wheat into cultivation.

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